CLAIMS

What is claimed is:

1. A method of predicting moisture absorption rate in materials, the method comprising the steps of:

drying a material for a time sufficient to remove residual moisture;

weighing said material;

placing said material within a substantially air tight chamber having a controllable atmosphere;

exposing the material to an environment of known controlled relative humidity in an inert gaseous atmosphere and controlled temperature;

collecting data of moisture absorption over time and using a curve fitting technique to fit the data to a curve using the equation

$$Y = aX^b$$

where: a is a constant ranging from about 0.001 to about 1.0;

b is a constant ranging from about 0.01 to about 10.0;

Y is the mass increase in grams H20 per 100 grams of material; and

X is humidification time in hours;

finding said constants a and b at said known controlled relative humidity and said controlled temperature for said material, assuming constant b is a constant value for the material,

and constant a is a variable that is directly proportional to the relative humidity in an inert gaseous atmosphere; and

modifying the variable a and holding the variable b constant to generate an expected moisture absorption mass gain versus time curve for a different specific relative humidity value.

2. The method of claim 1 wherein the known relative humidity ranges from 5 to 100%.

3. The method of claim 1 wherein the material is a PEM.

4. The method of claim 2 wherein the material is a PEM.

5. The method of claim 1 wherein relative humidity within said chamber is provided by wetted fibrous material disposed within said chamber.

6. The method of claim 5 wherein said atmosphere is circulated by a fan positioned within said chamber.

7. The method of claim 1 further including an atmospheric probe positioned within said chamber for recording atmospheric conditions.

8. The method of claim 5 further including an atmospheric probe positioned within said chamber for recording atmospheric conditions.

9. The method of claim 6 further including an atmospheric probe positioned within said chamber for recording atmospheric conditions.

10. The method of claim 1 wherein relative humidity within said chamber is controlled by gas injected into said chamber via a gas inlet.

11. The method of claim 10 further including an atmospheric probe positioned within said chamber for recording atmospheric conditions.

12. The method of claim 5 wherein the known relative humidity ranges from 5 to 100%.

13. The method of claim 5 wherein the material is a PEM.

14. The method of claim 12 wherein the material is a PEM.

15. The method of claim 10 wherein the known relative humidity ranges from 5 to 100%.

16. The method of claim 10 wherein the material is a PEM.

17. The method of claim 15 wherein the material is a PEM.

18. A method of predicting moisture absorption rate in materials, the method comprising the steps of:

drying a PEM for a time sufficient to remove residual moisture;

weighing said PEM;

placing said PEM within a substantially air tight chamber having a controllable atmosphere;

exposing the PEM to an environment having a controlled relative humidity ranging from 5 to 100% in an inert gaseous atmosphere and controlled temperature;

collecting data of moisture absorption over time and using curve fitting technique to fit the data to a curve using the equation

$$Y = aX^b$$

where: a is a constant ranging from about 0.001 to about 1.0;

b is a constant ranging from about 0.01 to about 10.0;

Y is the mass increase in grams H20 per 100 grams of said PEM; and

X is humidification time in hours;

finding said constants a and b at said known controlled relative humidity and said controlled temperature for said PEM, assuming constant b is a constant value for the PEM, and constant a is a variable that is directly proportional to the relative humidity in an inert gaseous atmosphere; and

modifying the variable a and holding the variable b constant to generate an expected moisture absorption mass gain versus time curve for a different specific relative humidity value.

19. An apparatus for measuring and predicting moisture absorption rate in materials, the apparatus comprising:

a substantially air-tight container adapted for placing a test specimen therein;

means for establishing controlled atmospheric conditions in said container; and

means for monitoring said atmospheric conditions within said container.

20. The apparatus of claim 19 further including:

means for circulating said atmosphere within said container.